
APPENDIX D.

Commercial and Recreational Fisheries

D.1 Essential Fish Habitat Assessment

D.2 Figures and Tables

APPENDIX D.1

Essential Fish Habitat Assessment

Essential Fish Habitat Assessment

MARS Cable Installation and Operation

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List of Abbreviations and Acronyms

CBC	Chemosynthetic Biological Communities
CCC	California Coastal Commission
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CNDDDB	California Natural Diversity Database
CSLC	California State Lands Commission
CWA	Clean Water Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FMP	Fishery Management Plan
PLGR	Pre-Lay Grapnel Run
PLIB	Post-Lay Inspection and Burial
MARS	Monterey Accelerated Research System
MBARI	Monterey Bay Aquarium Research Institute
MBNMS	Monterey Bay National Marine Sanctuary
MLML	Moss Landing Marine Laboratory
MOU	Memorandum of Understanding
MSFCMA	Magnunson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NSF	National Science Foundation
OOI	Ocean Observatories Initiative
ROV	Remotely Operated Vehicle
USACE	United States Army Corps of Engineers
VICKI	Video Information Capture with Knowledge Inferencing

Preface

As a result of the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the Department of Commerce's regulations (50 CFR 600.905-930), all activities or proposed activities, authorized, funded, or undertaken by a federal agency must consider adverse impacts to essential fish habitat (EFH). The National Marine Fisheries Service (NMFS) has provided guidance for agencies in their *November 1999 EFH Consultation Guidance* document (NMFS 1999; Guidance). This Guidance does not set absolute criteria for EFH consultation, but does suggest how the requirements should be met by NMFS and Federal action agencies. As provided in the Guidance document, five approaches are provided to meet consultation requirements: 1) use of existing procedures, 2) general concurrences, 3) programmatic consultations, 4) abbreviated consultation, and 5) expanded consultations.

The following document, *Essential Fish Habitat Assessment for Adverse Impacts from the MARS Cable Project*, provides an analysis of the effects from construction and maintenance operations on EFH, which will be traversed by the cable route. This assessment is provided as support documentation for a US Army Corps of Engineers individual Section 404 permit that will be sought. As directed by the Guidance, this assessment includes:

- A description of the proposed action;
- An analysis of the effects of the action on EFH;
- The Federal action agency's views on those effects; and
- Proposed mitigation (as applicable).

1

Proposed Action

MARS will be located in Monterey Bay offshore MBARI. It will consist of 51 kilometers of submarine cable and a science node located approximately 891 meters below the ocean surface. The node will have eight separate science ports (docking stations) for oceanographic instruments. Each port will support bi-directional data transfers of up to 100 Mbits per second. The cable and node will have the ability to supply up to 10 kilowatts of power to the instruments, much more power than could be supplied using batteries alone. The system will make use of the tools, techniques, and products developed over the last several decades for high reliability submarine telecommunication and military systems to ensure that this system can operate over a 25-year lifetime.

MBARI, along with the University of Washington, Jet Propulsion Laboratory, and Woods Hole Oceanographic Institution have received a grant from NSF to design and install the cabled observatory in Monterey Bay. Within the MARS team, Woods Hole Oceanographic Institution is developing the communications and command/control systems. The University of Washington and Jet Propulsion Laboratory are working on the power supply system. A private company, Alcatel, will be overseeing the actual construction and installation of the cable wet plant. MBARI will also team up with the Monterey Bay Aquarium to make scientific results from the MARS project available to students and the general public.

MBARI will provide the shore base for the network and will be involved in project management and engineering, including the permitting and environmental review process. This last element is critical to make sure the cable does not damage fragile marine ecosystems within the Monterey Bay National Marine Sanctuary.

In addition to supporting oceanographic research within Monterey Bay, MARS will serve as a testing ground for technologies to be used in more ambitious undersea networks, such as the NEPTUNE project (<http://www.neptune.washington.edu>).

1.1 Location and Vicinity

The entire cable route and node will be located within the boundaries of the Monterey Bay National Marine Sanctuary. Figure 1 shows the cable route in relation to MBNMS borders.

There are three possible shore landing locations for the fiber optic cable—the preferred option involves using an HDD to install a conduit (2-inch pipe) to contain the fiber optic and power cable beneath the bay and bring it ashore on MBARI property, the second option will use the existing Duke Energy fuel oil pipeline in the north harbor entrance, and the third option will use the planned Moss Landing Marine Laboratories pier south of the canyon head. Complete survey data has been collected for all landing locations and is presented in the MBARI application to the CSLC. At this time, MBARI is seeking approval to use any of the landing locations for the MARS cable route.

1.2 Cable Transmissions

The MARS cable will terminate in a node housed within a trawl resistant bottom mount. The node will have eight separate ports (docking stations) for oceanographic instruments. Each port will support bi-directional data transfers of up to 100 Mbits per second. The cable will also supply up to 10 kilowatts of power to the instruments, several orders of magnitude more power than could be supplied using batteries alone. Scientific data will be the typical data transmitted through the cable.

1.3 Cable Alternatives

The three potential alternatives for the shore landing are presented below.

Alternative 1 - MBARI Property to Offshore

This onshore landing is considered the preferred alternative by MBARI that involves using HDD to install a conduit (2-inch pipe) to bring the MARS cable ashore. HDD operations will be staged on MBARI property, which will serve as the HDD entry point. The HDD exit point will be at approximately 36° 48.75' N, 121° 48.05' W in the bay.

The MARS Shore Facility will include the shore power supplies, breakers, hubs, and other equipment necessary to feed power and communications to the observatory cable. The equipment will be housed in a 6-meter-long ISO van (a temporary structure typically used by scientists as portable laboratory space) or a similar modular structure. The ISO van will require placement on a concrete slab to meet all State and local building regulations and codes. The newly installed cable will reach MBARI Building D via existing overhead utility lines.

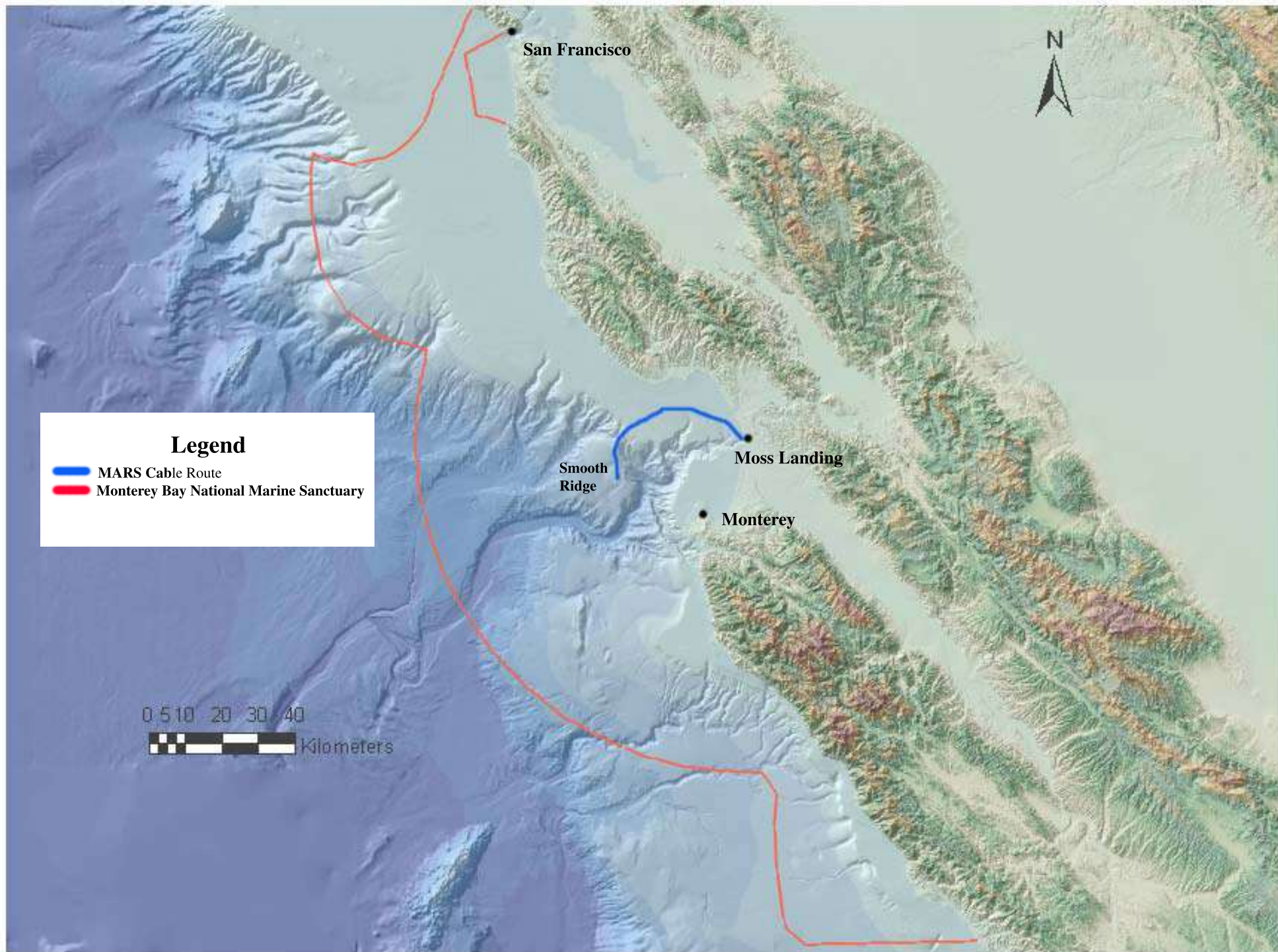


Figure 1 **Monterey Bay National Marine Sanctuary Boundaries**

1. Proposed Action

Alternative 2 - Duke Energy Pipeline to MBARI Property

The Duke Energy pipeline shore-landing site is a currently existing, unused fuel oil pipeline owned by Duke Energy and previously used to unload tankers. MBARI has obtained permission from Duke Energy to use this pipeline to land the MARS cable.

The pipeline extends in a west-northwest direction from the shore to a water depth of roughly 18 meters. The position of the end of the pipeline is 36°48.719' N, -121°48.037' W and is located approximately 153 meters from shore. There is no planned construction through the surf zone for this shore landing. The pipe is 18"-24" carbon steel and has been well maintained by Duke Energy. MBARI will modify the cap at the ocean end of the pipeline to include a seal allowing the MARS cable to enter the pipeline and will design the cap to minimize seawater corrosion.

The cable will run inside the pipeline to a point where the pipeline becomes exposed on the eastern side of the jetty located on Jetty Road at Moss Landing State Beach. From the pipeline exit point, an access hatch will be installed in the pipeline to allow the cable to be pulled ashore from the installation vessel. In order for the cable to reach MBARI property on the south side of the harbor channel, the cable will be installed approximately 30 feet (9 m) below the harbor channel using an HDD construction method. The drilling operations will be staged on MBARI property to minimize impacts to the Moss Landing State Park beach. A Drilling Fluid Monitoring and Remediation Plan and Work Execution Plan have been prepared for this proposed option and are presented in Appendix C.

Once the cable is brought onshore on MBARI's property, power to the cable will be supplied from an existing power source to the ISO van. From the ISO van, the fiber cable will be run along overhead utility lines back to MBARI Building D.

Alternative 3 - Moss Landing Marine Laboratories Pier

The alternative site runs from a water depth of approximately 16 meters at the estimated position for the end of a planned pier to be constructed by Moss Landing Marine Laboratories (MLML) on the seaward side of the MBARI facilities. The estimated position of the end of the pier is 36°48.266' N, -121°49.111' W. MLML has obtained permits to construct this pier and has given MBARI permission to land the MARS cable through conduit running alongside the pier.

From the pier, the cable will run in the conduit and follow the same path as an existing seawater intake pipe before terminating in a circuit breaker box located inside MBARI Building C.

For this alternative, Building C will serve as the Shore Facility, so no additional structures will be needed. As in the other alternatives, the Shore Facility Building C will house all items necessary for cable and node operations including uninterrupted power supply and all command and control equipment. The existing power

supply is sufficient to meet cable and node requirements (3 phase, 480-volt, 10kW).

Submarine Cable Route Alternatives

The selected ocean cable route as presented in Figure 1 is the preferred cable route. An alternate route for the MARS cable installation was investigated, but several serious problems were encountered that led to this option being abandoned. The alternate route did not meet all required science needs, the water depth was not sufficient for a deep water test bed node, and installation would have been more difficult than for the northern route due to rock outcrops.

This route cannot reach a location on the western side of the San Gregorian Fault line without crossing the canyon. Experience has shown that equipment or cables placed in the canyon at this location would likely survive less than a year before being destroyed by mass wasting events. One of the scientific aims of the MARS project is to connect to a permanent broadband seismometer located west of the San Gregorian fault line to complement the land-based network of broadband seismic stations. This is crucial to 1) provide better azimuthal coverage and thereby improve the characterization of moderate to large earthquakes occurring in northern California along the San Andreas system, and 2) to improve knowledge of the deep structure of this plate boundary. Also, experience in long-term deployment of broadband systems is crucial for the successful development of long-term global seismic sea floor observatories as advocated by the International Ocean Network.

The MARS observatory is a test bed for a deep-water cabled observatory, and many of the components and systems to be tested need to be located at a deep water site. The depth of the old alternate node is only 130 meters, and the engineering systems need water depths closer to 1,000 meters. Only the currently proposed route provides access to water with a depth suitable for the engineering tests.

There are no active seeps or chemosynthetic biological communities (CBCs) close to the alternative route node location. These are important study sites that, if connected to a cabled observatory, enable important long-term data to be collected on these benthic communities. Imaging systems and sensors deployed on a cabled observatory would document the behavior of individuals (e.g., clams), the dynamics of populations, and variation in the structure of seep and vent communities. Concurrent monitoring of fluid chemistry and other environmental factors (e.g., current speed), coupled with measurements of the response of the community to experimental manipulation of fluid chemistry, could help define the roles of intrinsic environmental (e.g., fluid chemistry) and biological factors versus external processes (i.e., effects of ocean currents on larval transport). Of the MARS routes investigated, only the currently proposed site provides a node location close to known CBCs and active seeps.



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Finally, studies have shown that there are many large rock outcrops on the edge of the continental shelf that would be problematic for cable laying.

2

Project Purpose and Overview

The goal of this project is to design and install an advanced cabled observatory in Monterey Bay that will provide a continuous monitoring presence in the Monterey Bay National Marine Sanctuary, as well as serve as the test bed for a state-of-the-art regional ocean observatory, currently one component of the National Science Foundation (NSF) Ocean Observatories Initiative (OOI). The test bed will provide real time communication and continuous power to suites of scientific instruments enabling monitoring of biologically sensitive benthic sites and to allow innovative scientific experiments to be performed.

The Monterey Bay Aquarium Research Institute, along with the University of Washington, Jet Propulsion Laboratory, and Woods Hole Oceanographic Institution have received a grant from NSF to design and install the cabled observatory in Monterey Bay. This observatory, the Monterey Accelerated Research System (MARS), will consist of an undersea cable and node that will provide power and high-speed data links for a variety of oceanographic devices.

MBARI's close relationship with the Monterey Bay Aquarium places it in a unique position to employ MARS as an educational tool for the public. The Monterey Bay Aquarium is one of the world's leading organizations devoted to teaching the public about the ocean. MBARI will bring MARS science and technology to the public through the Aquarium's world-class facility, drawing on the expertise of the MBA's staff of 420 employees and 900 volunteers.

Enhancing resource protection and preserving the natural beauty and bounty of the marine ecosystems within its boundaries is the purpose of the Monterey Bay National Marine Sanctuary. This can be accomplished by improving the understanding of the Sanctuary environment, resources, and qualities. The results of research conducted utilizing MARS can be used to make management decisions about resource protection, to develop and improve educational programs, and to help MBNMS, and similar agencies, fulfill their missions.

By supplying both data links and electrical power, this network will allow real-time, continuous, and long-term monitoring of conditions beneath the surface of the bay. Currently such information can only be gathered during intermittent ship

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cruises or using temporary devices that must eventually be retrieved when their batteries are depleted.

MARS will be located in Monterey Bay offshore MBARI. It will consist of 51 kilometers of submarine cable and a science node located approximately 891 meters below the ocean surface. The node will have eight separate science ports (docking stations) for oceanographic instruments. Each port will support bi-directional data transfers of up to 100 Mbits per second. The cable and node will have the ability to supply up to 10 kilowatts of power to the instruments; much more power than could be supplied using batteries alone. (See Appendix D for examples of instrumentation.)

The system will make use of the tools, techniques, and products developed over the last several decades for high reliability submarine telecommunication and military systems to ensure that this system can operate over a 25-year lifetime.

Within the MARS team, Woods Hole Oceanographic Institution is developing the communications and command/control systems. The University of Washington and Jet Propulsion Laboratory are working on the power supply system. A private company, Alcatel, will be overseeing the actual construction and installation of the cable wet plant.

MBARI will provide the shore base for the network and will be involved in project management and engineering, including the permitting and environmental review process. This last element is critical to make sure the cable does not damage fragile marine ecosystems within the Monterey Bay National Marine Sanctuary. MBARI will also team up with the Monterey Bay Aquarium to make scientific results from the MARS project available to students and the general public.

In addition to supporting oceanographic research within Monterey Bay, MARS will serve as a testing ground for technologies to be used in more ambitious undersea networks, such as the NEPTUNE project (<http://www.neptune.washington.edu>).

The broader implication of installing MARS is that the oceanographic community will be a giant step closer to providing real-time, continuous access to unprecedented power and communications capability underwater on a regional scale. This type of ocean observatory will revolutionize the way researchers study the ocean and the seafloor beneath. Benefits will include more cost-effective collection of much larger amounts of integrated, multidisciplinary data relevant to important scientific and societal issues, such as natural hazards, the climate system, the carbon cycle, and other biologically mediated processes in the ocean. In addition, researchers will use such facilities to explore entirely new classes of problems currently unapproachable with existing methods and instrumentation.

2. Project Purpose and Overview

MBARI is planning to contract with Alcatel to install the cable. Alcatel is currently processing data from the recent route survey (see Fugro 2004) to devise a work plan for MARS. This information can be provided as soon as it becomes available. Construction is planned for summer 2005, dependent on permitting.

3

MARS Installation Procedures

The MARS system consists of a single submarine cable between a shore station in Moss Landing and a node to be placed on the seabed at the end of the cable on Smooth Ridge. The estimated length of the cable is 51 kilometers. A target burial depth of 1.0 meter by plow is proposed, subject to suitable seabed conditions. As the maximum water depth is expected to be 891 meters, burial is proposed throughout the whole route, where burial is possible with the plow.

3.1 Pre-Lay Grapnel Run (PLGR)

Prior to the main lay operation, a pre-lay grapnel run (PLGR) will be carried out by the main lay vessel along the proposed cable route. The PLGR operation will be to industry standards employing towed grapnels. The intention is to attempt clearance of any seabed debris, for example wires or hawsers, fishing equipment etc. that may have been deposited along the route. Any debris recovered during these operations would be discharged ashore on completion of the operations.

The operation involves the towing of one or an array of grapnels along the length of the route to be plowed. The vessel proceeds at a rate to ensure that the grapnel(s) maintain continuous contact with the seabed. The grapnel is usually a 'sliding prong' type, which can penetrate up to 40 centimeters into the seabed. The grapnel is connected to the towrope or wire by means of a length of 30 meters of chain with a similar length of chain following the grapnel; the chain further assists in keeping the grapnel in contact with the seabed.

As the vessel moves along the route, the towing tension is monitored and the grapnel(s) is recovered if the tension increases indicating that an obstruction has been hooked. As a matter of routine, the grapnels are recovered and inspected at minimum intervals of 15 kilometers along the route. Usually a single tow is made along the route but in areas where other marine activity or debris amounts are high, additional runs may be made.

3.2 Main Lay Operations

The proposals for the main lay operation is to directly land the cable at the shore end and to plow bury the cable.

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The plow is hydraulically operated and is towed by a towrope from the cable installation vessel. The cutting depth of the plow is controlled by varying the position of the skids and the angle of the plow share. Rear stabilizers can be used to assist with depth control on soft ground. The plow is fully remote controlled from a control cabin onboard the vessel, while being towed. The plow is equipped with vertical and lateral cable angle sensor and visually by means of a forward TV camera.

Plow burial will be made along the route sections recommended by the survey and BAS, subject to seabed conditions.

3.3 Plowing Operations

When plowing, cable is laid to achieve a touch down just in front of the plow as described below:

The plow will be deployed and recovered by means of the 'A' frame located at the stern of the vessel. A 'docking frame' assembly is used to minimize any excessive pendulum motion caused by vessel movement when the plow is being handled out of the water.

The plow will be launched by lifting it from the working deck and moving the 'A' frame slowly outboard until the plow is clear of the stern; pay out will be continued until the plow is a few meters below the surface of the sea. At this stage the plow systems will be checked prior to transferring the weight of the plow to the towline and carefully lowering the plow to the seabed. As the plow is lowered the plow control umbilical with attached recovery line will be simultaneously paid out.

When the plow arrives at the seabed, the laying vessel moves slowly forward paying out cable to maintain tension, and adjustments are made to the tow wire and umbilical line to achieve the optimum towing scope or 'layback' for the plow. While these adjustments are made the plow remains stationary. Just prior to the start of plowing the tow winch rendering is set to avoid excessive towing tensions.

As the plow starts to move, the plow skids will be raised (causing the share to dig deeper into the seabed) and the depressor arm is lowered until the required burial depth is achieved. Cable will be paid out such that the cable reaches the seabed a few meters in front of the plow. This results in minimal residual cable tension measured at the plow.

When the end of the plowed section is reached, the skids are lowered and the depressor arm is raised causing the burial depth to be reduced to a minimum. The lay vessel is stopped and the towing scope is reduced while simultaneously recovering the umbilical and attached recovery line. When the plow lifts clear of the seabed, the lay vessel will move ahead very slowly as the plow is raised to the

3. MARS Installation Procedures

surface. Lay cable is paid out to maintain appropriate tension. The plow will be held at a point just below the surface while the recovery line is attached to the lift wire, which passes over a sheave at the top of the 'A' frame. The plow is then raised on the recovery/lift line to engage in the docking frame. Finally the 'A' frame is moved inboard, and the plow is lowered to the vessel's deck.

3.4 Trawl Resistant Node Frame Deployment

The cable will be installed from the sea towards the shore landing. It is anticipated that the cable will be plow buried throughout most of the cable route and that as the main lay vessel approaches the node installation point (approx. two times the water depth or two kilometers away), the plow will be recovered. It will then surface lay the cable and deploy the trawl resistant node frame on the end of a ground rope and continue surface laying the ground rope. When the trawl resistant node frame is on the seabed, an acoustic release will be activated which will part the ground rope just above the seabed leaving approximately two kilometers of ground rope attached to the node. This two-kilometer section of ground rope would then be recovered using the on-board ROV and a cutting tool and attaching a recovery rope to the ground rope.

The two-kilometer surface laid section of cable would be post-lay buried by jetting.

After the cable and the trawl resistant node frame have been deployed, MBARI's R/V *Point Lobos* will lower the MARS node onto the ocean floor near to the trawl resistant node frame. ROV *Ventana* will then latch onto the trawl resistant node frame, lift it, and then lower it into the trawl resistant node frame. The ROV will then attach the underwater mateable connectors between the node and the trawl resistant node frame to allow the node electronics to be connected to the shore through the cable.

3.5 Post-Lay Inspection & Burial (PLIB)

Post lay inspection and burial will be conducted by MBARI's ROV *Ventana*. This will include the following :

- Initial, final, and intermediate splice positions in the buried sections
- Burial in the plowed sections (where plow did not bury for operational reasons (i.e. soft conditions, steep slopes, etc.)
- Cable and pipeline crossings
- Any unburied sections required as part of the node deployment operation

In order to minimize the risk to the exposed cable, the PLB program will be designed, wherever possible, to closely follow that of the main lay vessel program.

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The proposals for PLB assume jetting into suitable seabed materials. Rock cutting, trenching, or similar is not proposed.

All post lay burial work will be inspected with an allowance for overlaps into adjacent plowed sections.

An ROV capable of 1.0-meter burial and ability to operate in water depths in excess of 1,000 meters will be used. The ROV will be free flying, or tracked, and fitted with lights, cameras, depth sensor, pitch and roll sensor, heading sensor, and other appropriate fittings required to perform the work.

Alcatel intend to use Makai software during cable installation operations. This sophisticated system is able to model the catenary of the cable and predict the required cable slack, thereby minimizing the risk of installing loops in the cable system.

Horizontal Directional Drill (HDD) Procedures for Shore Landing

Alternative 1 - MBARI Property to Offshore. The HDD procedures for Alternative 1 for the MBARI property to offshore include an estimated bore length of 4,700 feet (1,432 m) that would be installed an estimated depth of 90 feet (27 m) to 100 feet (30 m) below sea level. An onshore drilling crew, marine support crew, and construction monitors will support the HDD procedures. The onshore drilling crew will operate the drill rig, mud system (i.e. drilling fluid to lubricate the drill bit), and support equipment. The marine crew will guide and verify the drill path, and adjust the drill path if necessary. During the drilling procedure, the drill path will be constantly monitored for surface releases of drilling mud, and constant communication will occur between the monitoring vessel and the control cab during the entire HDD procedure.

The entry and exit points will be established, and relative elevations and drill distances surveyed in and verified. During this operation, any existing sub-surface obstructions in the area will be identified and staked. A sub-bottom profile of the ocean floor will be done to verify the depths provided are correct so as to establish a true running line and elevation for the drill path. The marine support crew will set a buoy at the exit coordinate provided by the client, and this distance will also be measured and verified. The drill path might need to be adjusted slightly should any conflict with an existing utility be encountered. The anticipated depth (90 to 100 feet) should be deep enough to hinder the release of drilling mud to the surface and stay above the unknown formations below based upon information gather to establish the geologic setting. Where possible a locating grid will be surveyed in along the entry portion of the drill path and a thin 8 ga. wire laid out on the perimeter. While drilling, a small DC current will be induced into the wire to create a magnetic field with known corner points that can be picked up by the sensor in the steering tool. This grid is used to verify the locational readings transmitted to the control cab continuously through a wire in the drill stem. The

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steering tool, located behind the drill bit, keeps track of the azimuth and the inclination, giving the surveyor an accurate location of the bit at all times.

The staging area for the directional drill would be located on the south side of the entry channel on MBARI property (Assessor Parcel Number 133-252-001). A site 100 feet by 150 feet will be used to set up the equipment; drill rig, mud system, extra drill pipe, support vehicles, and enclose the entry pit.

Site preparation will require the construction of a concrete pad (10 ft by 6 ft by 4 ft) that will be used to anchor the drill rig during the HDD procedures. Prior to placing the drill rig on the concrete pad, plastic barriers will be placed under the drilling equipment and oil absorbent blankets around hydraulic components will ensure protection between the drill rig and ground surface if a spill were to occur.

The bore entry point will be established by excavating a small sump pit that will be used for the recovery of the drilling fluid coming from the borehole back to the surface. The fluid will be picked up by a sump pump and transferred to a solids control unit where the solids contained in the drilling fluid will be mechanically separated allowing the mud to be recirculated down the bore hole for use again. Once all the equipment is in place, silt fences and hay bales will in place around the work perimeter, the sump pit, and mud recovery system.

When the drilling rig is in place and all the environmental measures have been implemented, drilling will begin. As the HDD proceeds along the pre-determined route drilling fluid is pumped down the inside of the bore pipe and exits through the drill head. The fluid then returns to the entry pit through the annulus between the outside of the drill pipe and the formation being bored. The drilling fluid is composed of naturally occurring bentonite clay and water. The clay is insoluble and made up of small particles that function as a lubricant for the drill head and pipe, a transport for the cuttings being removed from the hole, and as a sealant that fills the annulus space surrounding the drill hole.

As the drill stem approaches the exit point on the ocean floor, the drilling conditions will be monitored to determine the time or distance from exit when a shift from the bentonite to fresh water drilling will be done. By flushing the drill string with fresh water, the drilling mud is circulated out of the system and a mud free exit is achieved. The shift from bentonite to fresh water is determined by the soil conditions near exit point. As general rule of thumb, 150 feet is the average distance at which a change to fresh water happens. Once the drill exits the sea floor the marine support crew will be dispatched to dive on the exit and verify the exit point. Once the exit has been verified, the on-site inspector will be given the off-shore exit coordinate to approve. The approval must not be delayed, as the drill string will need to be withdrawn as quickly as possible to avoid getting stuck in the hole.

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Once the exit has been approved, divers will jet down approximately 2 feet below the sea floor and use underwater cutting equipment to cut off the drill steel at the desired depth. Once the pipe is cut and the end of the pipe has been de-burred to remove any sharp edges, the guidance wire will be removed and a pipe pig will be installed at entry with a 1/4" cable attached. The pipe pig will be hydraulically pushed through the drill pipe with fresh water and the 1/4" cable trails the pig. The pig proofs the pipe as well as verifies a clean I.D.

Once the HDD procedure is complete, the temporary pull-line installed, and the pipe is capped and back-filled, the drill crew will de-mobilized. The de-mobilization involves removing all excess drilling fluid from the sump pit and disposed of at an appropriate site. The plastic barriers and oil absorbent cloth will be removed and disposed of appropriately including the silt fence and hay bales. The concrete pad used to anchor the drill rig will be broken up and removed from the site and any excavation back-filled, and the work area will be returned to its original condition or better to the satisfaction of all permitting agencies, public works inspectors and supervising engineer.

Alternative 2 - Duke Energy Pipeline to ISO Van on MBARI Property

The HDD procedures for Alternative 2 the Duke Energy Pipeline to ISO Van on MBARI property include an estimated bore length of 1,014 feet (309 m) that would be installed an estimated depth of 30 feet (9 m) below the channel. An on-shore drilling crew, and construction monitors will support the HDD procedures. The onshore drilling crew will operate the drill rig, mud system (i.e. drilling fluid to lubricate the drill bit), and support equipment. During the drilling procedure, the monitoring vessel situated within the channel entrance will constantly monitor for surface releases of drilling mud, and maintain constant communication with the control cab during the entire HDD procedure.

Entry and exit points will be established, and relative elevations and drill distances surveyed in and verified, and a sub-bottom profile of the channel may need to be done to verify the proposed depth to install the cable are correct in order to establish a true running line and elevation for the drill path. The proposed 30 feet (9 m) depth to bury the conduit below the channel entrance should reduce the potential of drilling fluids being released to the surface.

The staging area for the HDD is within the same parcel identified in Alternative 1. However, the extra workspace area that will be used to set up the equipment; drill rig, mud system, support vehicles, and enclose the entry pit is 75 ft by 75 ft. The same erosion control structures and added protection measures used for Alternative 1 will be used for this alternative with the exception of the concrete pad to anchor the drill rig, which is not required for an HDD of this length.

The HDD procedures are similar to Alternative 1 with the exception of the exit location near the Duke Energy pipeline exposed on the north side of the channel.

3. MARS Installation Procedures

A small pit will be dug for use as an exit location. The exit pit will hold the drilling mud, keeping it away from any sensitive areas, and allowing a convenient location for collection and disposal.

After successfully pulling the 2-inch conduit, a pull line will be blown through the conduit and tied off for use at a later date. The conduit ends will be capped and buried. In the event of an uncompleted bore hole, a pressure grouting method should be used to fill the void. By injecting a grout mix into the drill stem as it is being pulled out of the hole, the vacant cavity is filled.

Once the HDD procedures are complete excess drilling fluid will be removed from sump pit and disposed of at an regulatory approved disposal site. All plastic barriers and oil absorbent cloth will be removed and disposed of. Silt fence and hay bales will be removed. The work area will be returned to its original condition or better to the satisfaction of all permitting agencies, public works inspectors and supervising engineer.

Effects of the HDD procedures for both Alternatives include the potential for drilling muds (frac-out) to be released in an upland area (beach area) or within the bay. The accidental releases of drilling fluids could cause short-term degradation of surface water.

4

Required Permits

The list of permits required prior to project initiation are provided in Table 4-1.

Table 4-1 Required Permits for MARS Cable Project

Agency	Permit/Authorization/Consultation
Monterey Bay National Marine Sanctuary (MBNMS)	Special Use Permit
National Oceanic and Atmospheric Administration (NOAA)	National Environmental Policy Act (California Environmental Quality Act) Review
US Army Corps of Engineers	Nationwide 12 Permit (Section 10 of Rivers and Harbors Act and Section 404 of Clean Water Act)
US Fish and Wildlife Service	Letter of Concurrence (under Section 7, Endangered Species Act)
NOAA Fisheries - National Marine Fisheries Service	Letter of Concurrence (under Section 7, Endangered Species Act)
California State Lands Commission (CSLC)	Lease of State Lands
California Coastal Commission (CCC)	Coastal Development Permit Federal Consistency Certification
State Water Resources Control Board	National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activities
California Department of Fish & Game	Letter of Concurrence (under Section 7, Endangered Species Act)
California Department of Parks and Recreation (CDPR) Office of Historic Preservation	Consultation and Memorandum of Understanding (MOU) (under Section 106 of the National Historic Preservation Act)
Air Resources Board or Monterey Bay Unified Air Pollution Control District	Air Quality Authorization

4. Required Permits

Table 4-1 Required Permits for MARS Cable Project

Agency	Permit/Authorization/Consultation
Central Coast Regional Water Quality Control Board	Quality Certificate (under Section 401 of the CWA)
Northwest Information Center	Consultation and Historic Resources Update
Moss Landing Harbor District	Special Activities Use Permit or similar
Monterey County Planning and Building Department	Building Permit, if necessary

5

Proposed Schedule

The proposed schedule is to begin installation in the summer of 2005. The duration of each activity is noted below in Table 5-1.

Table 5-1 Proposed Schedule

Project Component	Duration
Project Preparations	5 weeks
Ile de Re Preparations	4 weeks
Ile de Re Main lay and burial	2 weeks
Horizontal Directional Drill	1-2 weeks
Shore-end works	1 week
Ile de Re Completion	2 weeks
Reporting	11 weeks

6

Collection of Supporting Offshore Field Data

A great deal of time has been spent reviewing data to select a route that accomplishes all the goals MBARI has set forth including: termination in an area of scientific interest, avoidance of restricted areas and obstructions, avoidance or minimization of impacts on sensitive natural resources and local communities, protection of the cable, and burial to the fullest extent possible along the entire cable route.

The overall purpose of the cable is to supply power and bandwidth to a scientific node, which will allow researchers to gather data from instruments in unprecedented volumes for extended periods of time. The site for this node was carefully selected. It is an area where science working-groups would like to establish time series instrumentation to further our understanding of poorly constrained oceanographic and geological processes. The node will be located at the end of the cable route. This location is on Smooth Ridge, a site important for scientific studies.

The proposed route has also been selected to avoid restricted areas and obstructions. Restricted areas include military zones (i.e. mainly navy and submarine exercise areas and firing range areas), protected areas such as marine sanctuaries or reserves, anchorage areas, and shipping lanes. Obstructions include buoys, rocks and shoals, wrecks, dumping areas, unexploded ordinance, and any other risks to a submarine cable.

To avoid or minimize impacts on sensitive natural resources, MBARI has chosen the most direct route possible while still achieving their goal to place the node in an area of scientific interest. This, coupled with burial, should assist in keeping impacts to a minimum. Burial will also serve to avoid conflicts with fisheries equipment and will help to protect the cable.

Additional factors were considered to protect the cable, including areas where burial difficulties may be encountered. Specifically, it will be problematic to bury cable due to substrate morphology along the entrance to Smooth Ridge. In areas where the route may encounter steep slope gradients, the route was designed to run as perpendicular as possible to slopes and to avoid possible areas of sediment slump or slides. Also, to allow better control during cable laying/burial operations, turns in the route are kept to a maximum of 10°.

6.1 Biological Surveys

In an effort to characterize benthic infaunal and epifaunal communities along the proposed Monterey Accelerated Research Program (MARS) cable route, MBARI conducted biological surveys in October 2003 through February 2004. During these surveys, Remotely Operated Vehicles (ROVs) were used to collect video data and sediment cores for studies of infaunal diversity and abundance. For this analysis, data from video and sediment samples collected was incorporated during a study of the former proposed MCI cable route that followed a portion of the MARS route. Generally, polychaete worms were the most abundant and species diverse group of infaunal organisms. Seapens were present on a large portion of the route, and were found in high density in many areas. Most of the fauna on the cable route are sedentary or functionally sedentary (i.e. very limited mobility). There are large numbers of suspension and filter feeders.

Methods

Shallow (23-573 m) areas of the 52.9 km-long MARS cable route were investigated with the MBARI *R/V Point Lobos* using the *ROV Ventana*. *Ventana* is equipped with a Sony HDC-750A high definition camera with HA10X5.2 Fujinon Zoom Lens. Deeper habitats (576-972 m) were surveyed with MBARI *R/V Western Flyer* using the *ROV Tiburon*. *Tiburon* is equipped with a Panasonic WVE550 3-chip camera. Lasers mounted on the ROVs were used to define the size of the area viewed in video images. Two lasers were mounted on the ROVs with beams parallel and spaced 30.5 cm apart. Over 38 hours of video was recorded using Sony Digital Betacam tapes as our recording media.

Additional surveys were conducted in 1999 from 47-450 m using the 100-foot vessel *Deanna Lee* equipped with a Phantom DS4 ROV. This portion of the survey line followed the former proposed MCI cable route (Towers 2003). Personnel from Oceaneering International, Inc. operated the ROV. The Phantom was equipped with a Benthos Model 387 35-mm camera and a Simrad Color Zoom Video camera model OE1366, and two lasers spaced 30 cm apart. The video feed from the Simrad camera was analog (composite); recordings were made to digital (miniDV) tape.

Specific sampling locations were chosen along the route to target representative depths (24, 44, 47, 640, 770, 795 and 885 m), and unique substrate and habitat types (e.g. sand, mud, hard substrates). Quantitative video transects and infaunal sampling was conducted at each of 11 pre-defined stations (Figure 2).

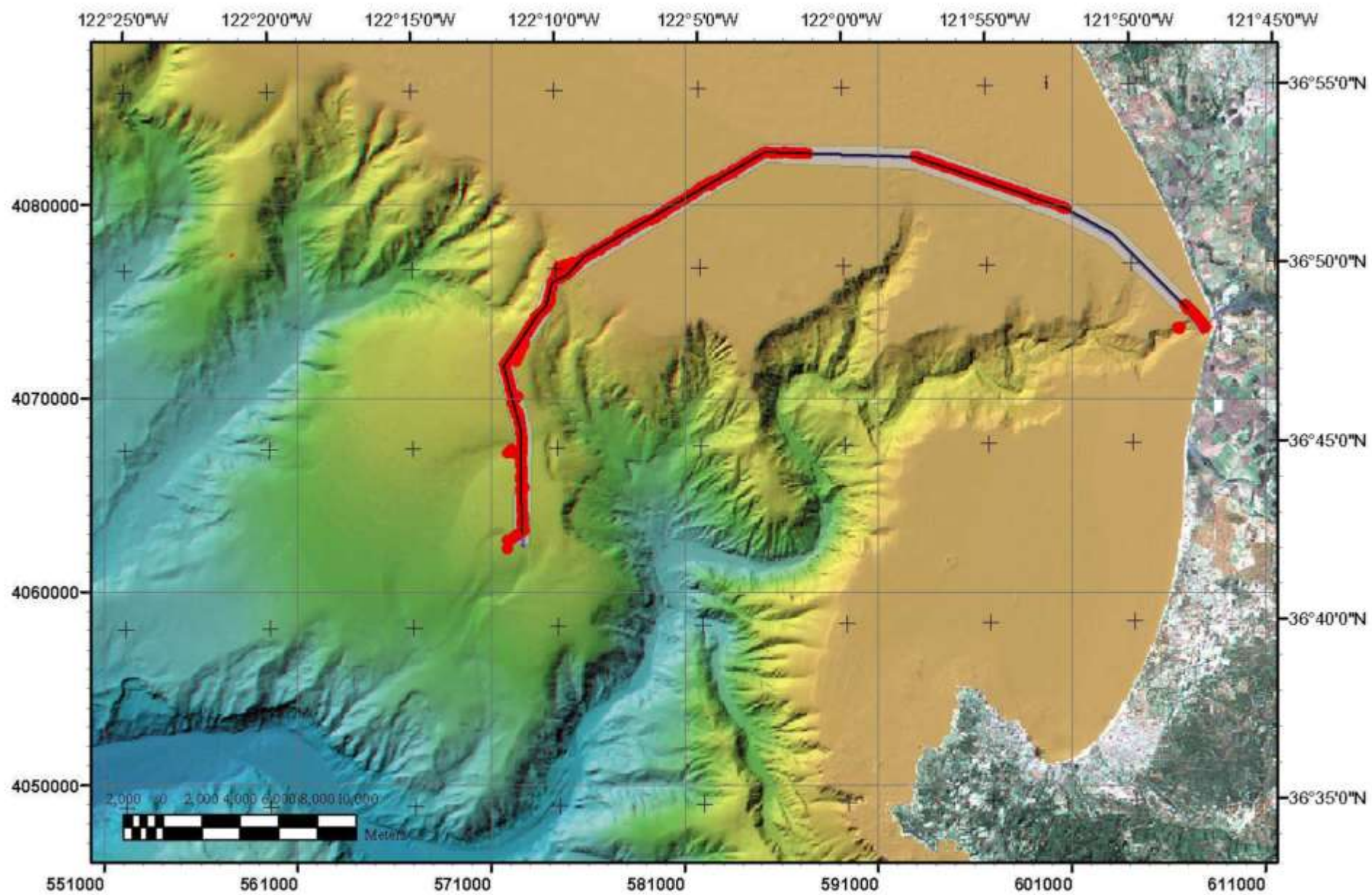


Figure 2. Extent of biological surveys (red) along the proposed MARS cable route (blue). ROVs were used to characterize the habitat and biota.

6. Collection of Supporting Offshore Field Data

Infaunal Analysis

In order to characterize macrofaunal communities at the 24, 44, 47, 640, 770, 795 and 885m stations, the ROV was used to collect samples of seafloor sediments with 7.5 cm diameter push cores (0.0044 m²). Cores collected from each station were spaced approximately five meters apart. Sediment from the top 5 cm of the core was washed gently through a 0.3 mm mesh sieve using cold seawater. Macrofauna at the 60, 90, 325 and 450 m stations were collected with a Smith-McIntyre grab. This is a common grab sampler for collecting quantitative seafloor samples (Lie, 1970), which was lowered from the ship to the seafloor on a cable. The grab collects 0.1 m² of bottom sediments to a depth of ~10 cm.

Epifaunal Analysis

Video footage was annotated and analyzed to assess megafaunal communities present on the seafloor along the proposed route. Megafauna are defined as epifaunal animals large enough to be seen on video recordings, a distinction that provides almost no overlap with the macrofauna portion of the study. All available video footage was annotated using MBARI's computer annotation application Video Information Capture with Knowledge Inferencing (VICKI). Video transects surrounding sampling stations were annotated quantitatively.

ROV Surveys of Megafaunal Abundance

Taxonomic identification was performed to the lowest practical taxonomic level. To assess the patchiness and dispersion of megafauna, transects at each station were subdivided into 25 m subsections, which were considered as replicate sample units. The length of replicates was determined using several criteria: 1) maximizing the number of replicates within each transect, 2) minimizing the number of replicates with zero taxa, and 3) choosing a replicate size above the resolution of ROV navigation. Organisms were grouped into major taxonomic groups, within which the abundance and number of lesser taxa were determined for each 25m replicate along each transect. The mean and variance of the number and abundance of taxa were determined for each major group along each transect.

6.2 Results and Interpretation

Infaunal Analysis

A total of 67 push cores and nine Smith-McIntyre grab samples were collected. Polychaete worms were the dominant group both in abundance and taxa richness at most depths. Abundant polychaetes included *Magelona hartmanae*, *M. sacculata* and *Scoletoma luti* (25 m), *Chaetozone lunula*, *Aricidea (Acmira) catherinae*, and *Mediomastus* spp. (44 m), *A. catherinae* (47 m), *Sternaspis nr. fossor* (60 m), *Mediomastus* spp. and *Spiophanes berkeleyorum* (90 m), *Sphaerosyllis ranunculus* (325 m), *Onuphidae* spp., *Protodorvillea gracilis* and *S. ranunculus* (450 m) and *Cossura pygodactylata* (885 m). Oligochaetes dominated at the 885 m station. Gammarid amphipods were the most abundant organism at the 640 m (*Ampelisca unsocalae*, *Lepidepcreum serraculum* and *Tiron biocellata*), 770m (*A. unsocalae*, *Photis typhlops* and *Byblis barbarensis*), and 795 m (*L. serraculum*

6. Collection of Supporting Offshore Field Data

and *A. unsocalae*) stations. Gammarids were relatively abundant (one the top five most abundant taxonomic groups of animals) at all stations. Other relatively abundant animals include Bivalves (44, 47, 60, 90, 640 m), Nemertea (44, 47 m), Ostracods (44, 47, 325 m), and Ophuroids (60, 90, 450 m). Caprellids (*Tritella tenuissima*) and Tanaids were abundant at the 325 and 450 m stations. Taxa diversity for Gastropods was relatively high at the 60, and 90 m stations, and for Ophuroids at 90 and 325 m. Isopods and Tanaids were diverse at 325 m.

Benthic Megafaunal Analysis

MBARI surveyed 55.2 km of benthic habitat during this investigation. Some of the 52.9 km proposed MARS cable route was overlapped during 10 ROV dives; 76 percent of the 52.9 km route was observed. Thirty-nine hours of video footage were annotated and analyzed.

Some species were not represented in quantitative video samples. There was a gradient in the distribution and abundance of benthic megafauna from the shallow, energetic (sand ripples) stations dominated by mobile megafauna and accumulations of drift kelp and other debris, to less physically disturbed (by wave action) sites on the continental shelf (60 – 139 m) that included higher densities of sessile sediment-dwelling megafaunal invertebrates, notably the seapens *Ptilosarcus* and *Pennatula*.

Due apparently to chronically higher rates of erosion, the substratum on continental shelf break and upper slope are often rock outcrops, which house a variety of sessile invertebrates and serve as physical structure favored by various mobile fishes and invertebrates. Sedimentary substratum returns deeper (>450 m) on the continental slope where seapens once again are conspicuous members of the benthos, which also includes a variety of anemones and holothurians. The relative abundance of fishes declines with depth, as invertebrates become more abundant.

Between 10-24 m, there was poor visibility and a rippled sand bottom, with large areas with shell hash, sparse drift kelp and no visible fauna. Other areas in this depth range included patchy accumulations of brown, green and red algae with occasional *Cancer* crabs, seastars, polychaete worms (*Diopatra ornata*), and small flatfish (*Citharichthys* spp.). Structures at the Kaiser (National Refractories) outfall (12.5 m water depth) and the Duke Energy outfall (18.7 m water depth) supported communities of the small corallimorph *Corynactis californica* and large anemones (*Metridium farcimen*). At 25-39 m, sand with drift kelp and gastropods were the dominant seafloor features, plus sparse sea pens, flatfish, seastars and drifting eel grass. Between 40 and 59 m there were abundant Ceriantharid anemones, flatfish (*Citharichthys* spp.), the seastar *Luidia foliolata* and the seapen *Stylatula elongata*; the substrate here was silty mud with fine grain sand. From 60 to 139 m, *S. elongata*, and the seastar *Rathbunaster californicus* were very abundant. The anemone *Metridium farcimen*, flatfish, seapens *Ptilosarcus gurneyi* and *Pennatula* sp. were also common. There are occasional scoured surfaces and occasional rock outcrops. At 140-200 m *R. californicus* was the domi-

6. Collection of Supporting Offshore Field Data

nant organism. few species of rockfish, flatfish and holothurians were present, but not abundant. Shell hash was locally dense in some areas between 175-191 m. Rock outcrops became more prevalent from 280-449 m and the substrate surface appeared eroded at around 425m. *Allocentrotus fragilis* (urchin), *Merluccius productus* (Pacific Whiting), and *R. californicus* were very abundant. Other species associated with hard substrates (rockfish, sponges, anemones, holothurians, and crinoids) were also present in high numbers. There were numerous rays (primarily *Raja rhina*), catsharks, and several species of flatfish. There was a large aggregation of hermit crabs at 474 m. From 450-599 m the seapen *Halipteris californica* was the dominant organism. The *Liponema brevicornis* (an anemone), *M. productus* and the flatfish *Microstomus pacificus* were also present in high abundance. At depths over 600 m seapens *H. californica*, and *Umbellula lindahli* dominated. The crab *Chionoecetes tanneri*, the rockfish *Sebastolobus*, gastropods and small Mesomyarian anemones were very common.

Quantitative Transects

Within the ROV survey areas, MBARI analyzed 10 quantitative transects ranging from 250 to 1675 m. The total footage covered 7,825 m of benthic habitat. Quantitative transects were not possible at 25 m due to low visibility. Seapens (*Pennatulacea*) were the most abundant and most species diverse megafaunal organism on the proposed MARS cable route. A dense assemblage of *H. californica* was present at 885 m; this species was also very abundant at the 640 and 795 m stations. *U. lindahli* was very abundant at all stations from 640 to 885 m. In shallower water (47, 60 and 90m), *S. elongata* was present in high numbers. Other relatively abundant organisms (top five most abundant taxa) included gastropods (44, 47 and 450 m), ceriantharids (47, 450, and 640 m), *R. californicus* and *A. fragilis* (325 m), the anemone *Liponema brevicornis* (450 m), *Sebastolobus*, *C. tanneri* (640, 795 m) and the holothurian *Pannychia moseleyi* (885 m). Sponges (Porifera) were only found on hard substrates from 90 to 450 m. Anemones (Actinaria) were observed at most stations as were crabs (Brachyura), and seastars (Asteroidea). Corallimorphs were found primarily at deeper depths.

Due to poor visibility, none of the fishes at the 44 m station were identifiable to species. Pleuronectiformes (unidentifiable flatfish) and flatfish from the families Bothidae and Pleuronectidae) were found at all stations. Bothids were most abundant at the 60 and 90 m. Hagfish (Myxinidae) were consistently present from 450 to 885 m. *Sebastolobus* (Scorpaenidae) was present from 640 to 885 m. Zoarcids were represented at all stations from 325 to 885 m. The highest total megafaunal abundance/m was at the 885 m station and 325 m stations, where invertebrates taxa (mainly seapens) accounted for the majority of the megafauna observed. The richness of megafaunal taxa was greater at mid depths for both invertebrates and demersal fishes, with the highest diversity at the 325 m stations. A higher number of invertebrate taxa were present at all depths except at the 60 m station where more species of demersal fish were present.

6. Collection of Supporting Offshore Field Data

Summary and Discussion

A total of 39 hours of video, 67 push cores and nine Smith-McIntyre grabs were collected from 11 stations. A cumulative distance of 55.2 km of seafloor was surveyed at least once. Seventy-six percent (40.2 km) of the 52.9 proposed MARS cable route was observed.

Polychaete worms were the most abundant and species diverse group of infaunal organism. Seapens were present on a large portion of the route and we found in high density in many areas. Most of the fauna on the cable route are sedentary or functionally sedentary (i.e. very limited mobility). There are large numbers of suspension and filter feeders. Avoidance of the ROV by some invertebrates and especially fishes may have led to a conservative bias for taxa richness, while attraction to the ROV lights may have overrepresented it. Adams et al. (1995) found that Pacific whiting (*Merluccius productus*) was strongly attracted to an ROV while sablefish (*Anoplooma fimbria*) and catsharks (Scyliorhinidae) showed a strong avoidance response. All three of these fishes were represented in our study.

7

Potential for EFH Adverse Impacts

This document addresses potential impacts to essential fish habitat (EFH) within California state waters (shore to 3 nautical miles) and to the outer limit of the Exclusive Economic Zone (EEZ; ~200 nautical miles). The geographic scope will facilitate consistency with permitting requirements of the California Coastal Commission (CCC) and the U.S. Army Corps of Engineers (USACE).

For the Pacific region, EFH has been identified for 89 species (Table 7-1) covered by three fishery management plans (Coastal Pelagics FMP, Pacific Salmon FMP, and Pacific Groundfish FMP) under the auspices of the Pacific Fishery Management Council. The ecologically diverse area encompassed by identified EFH includes those essential for fish spawning, breeding, feeding, or growth to maturity. The maintenance of a healthy and viable benthic community is recognized as critical to supporting most, if not all, of the life history requirements previously mentioned. This biological impact assessment for the proposed project focuses on determination of long and short-term impacts to benthic communities, with an understanding that significant impacts to these communities may cause adverse effects to fishery communities which are dependent on those resources.

Table 7-1 Fishery Management Plans and managed Species or Species Complexes for the Pacific Region

Coastal Pelagics FMP
Northern anchovy - <i>Engraulis mordax</i>
Pacific sardine - <i>Sardinops sagax</i>
Pacific (chub) mackerel - <i>Scomber japonicus</i>
Jack mackerel - <i>Trachurus symmetricus</i>
Market squid - <i>Loligo opalescens</i>
Pacific Salmon FMP
Chinook salmon – <i>Oncorhynchus tshawytscha</i>
Coho salmon - <i>Oncorhynchus kisutch</i>
Pink salmon - <i>Oncorhynchus gorbuscha</i>

7. Potential for EFH Adverse Impacts

Table 7-1 Fishery Management Plans and managed Species or Species Complexes for the Pacific Region

Pacific Groundfish FMP
Butter sole - <i>Isopsetta isolepis</i>
Curlfin sole - <i>Pleuronichthys decurrens</i>
Dover sole - <i>Microstomus pacificus</i>
English sole - <i>Parophrys vetulus</i>
Flathead sole - <i>Hippoglossoides elassodon</i>
Pacific sanddab - <i>Citharichthys sordidus</i>
Petrale sole - <i>Eopsetta jordani</i>
Rex sole - <i>Glyptocephalus zachirus</i>
Rock sole - <i>Lepidopsetta bilineata</i>
Sand sole - <i>Psettichthys melanostictus</i>
Starry flounder - <i>Platichthys stellatus</i>
Arrowtooth flounder - <i>Atheresthes stomias</i>
Ratfish - <i>Hydrolagus colliei</i>
Finescale (Mora) codling - <i>Antimora microlepis</i>
Pacific (Roughscale) rattail - <i>Coryphaenoides acrolepis</i>
Leopard shark - <i>Triakis semifasciata</i>
Soupfin shark - <i>Galeorhinus galeus</i>
Spiny dogfish - <i>Squalus acanthias</i>
Big skate - <i>Raja binoculata</i>
Longnose skate - <i>Raja rhina</i>
Pacific ocean perch - <i>Sabastes alutus</i>
Shortbelly rockfish - <i>Sebastes jordani</i>
Widow rockfish - <i>Sebastes entomelas</i>
Aurora rockfish - <i>Sebastes aurora</i>
Bank rockfish - <i>Sebastes rufus</i>
Black rockfish - <i>Sebastes melanops</i>
Black-and-yellow rockfish - <i>Sebastes chrysomelas</i>
Blackgill rockfish - <i>Sebastes melanostomus</i>
Blue rockfish - <i>Sebastes mystinus</i>
Boccaccio - <i>Sebastes paucispinis</i>
Bronzespotted rockfish - <i>Sebastes gilli</i>
Brown rockfish - <i>Sebastes auriculatus</i>
Calico rockfish - <i>Sebastes dallii</i>
California scorpionfish - <i>Scorpaena guttata</i>
Canary rockfish - <i>Sebastes pinniger</i>
Chilipepper - <i>Sebastes goodei</i>
China rockfish - <i>Sebastes nebulosus</i>
Copper rockfish - <i>Sebastes caurinus</i>
Cowcod rockfish - <i>Sebastes levis</i>
Darkblotched rockfish - <i>Sebastes crameri</i>

7. Potential for EFH Adverse Impacts

Table 7-1 Fishery Management Plans and managed Species or Species Complexes for the Pacific Region

Pacific Groundfish FMP (cont.)
Flag rockfish - <i>Sebastes rubrivinctus</i>
Gopher rockfish - <i>Sebastes carnatus</i>
Grass rockfish - <i>Sebastes rastrelliger</i>
Greenblotched rockfish - <i>Sebastes rosenblatti</i>
Greenspotted rockfish - <i>Sebastes chloroatictus</i>
Greenstriped rockfish - <i>Sebastes elongatus</i>
Harlequin rockfish - <i>Sebastes variegatus</i>
Honeycomb rockfish - <i>Sebastes umbrosus</i>
Kelp rockfish - <i>Sebastes atrovirens</i>
Mexican rockfish - <i>Sebastes macdonaldi</i>
Olive rockfish - <i>Sebastes serranoides</i>
Pink rockfish - <i>Sebastes eos</i>
Quillback rockfish - <i>Sebastes maliger</i>
Tiger rockfish - <i>Sebastes nigrocinctus</i>
Treefish - <i>Sebastes sericeps</i>
Vermillion rockfish - <i>Sebastes miniatus</i>
Yelloweye rockfish - <i>Sebastes ruberrimus</i>
Yellowmouth rockfish - <i>Sebastes reedi</i>
Yellowtail rockfish - <i>Sebastes flavidus</i>
Longspine Thornyhead - <i>Sebastolobus altivelis</i>
Tiger rockfish - <i>Sebastes nigrocinctus</i>
Treefish - <i>Sebastes sericeps</i>
Vermillion rockfish - <i>Sebastes miniatus</i>
Yelloweye rockfish - <i>Sebastes ruberrimus</i>
Shortspine Thornyhead - <i>Sebastolobus alascanus</i>
Cabazon - <i>Scorpaenichthys marmoratus</i>
Kelp greenling - <i>Hexagrammas decagrammus</i>
Lingcod - <i>Ophiodon elongatus</i>
Yellowmouth rockfish - <i>Sebastes reedi</i>
Yellowtail rockfish - <i>Sebastes flavidus</i>
Longspine Thornyhead - <i>Sebastolobus altivelis</i>
Redstripe rockfish - <i>Sebastes proriger</i>
Rosethorn rockfish - <i>Sebastes helvomaculatus</i>
Rosy rockfish - <i>Sebastes rosaceus</i>
Rougheye rockfish - <i>Sebastes aleutianus</i>
Sharpchin rockfish - <i>Sebastes zacentrus</i>
Shortracker rockfish - <i>Sebastes borealis</i>
Silvergrey rockfish - <i>Sebastes brevispinis</i>
Speckled rockfish - <i>Sebastes ovalis</i>
Splitnose rockfish - <i>Sebastes diploproa</i>
Squarespot rockfish - <i>Sebastes hopkinsi</i>

7. Potential for EFH Adverse Impacts

Table 7-1 Fishery Management Plans and managed Species or Species Complexes for the Pacific Region

Pacific Groundfish FMP (cont)
Starry rockfish - <i>Sebastes constellatus</i>
Stripetail rockfish - <i>Sebastes saxicola</i>
Pacific cod - <i>Gadus macrocephalus</i>
Pacific whiting - <i>Merluccius productus</i>
Sablefish - <i>Anoplopoma fimbria</i>

8

Analysis of Effects

8.1 Setting

The approach used in this analysis to establish the setting and collect information to assess project impacts consists of the following steps:

1. Initial review of existing biological information. In order to determine the presence (or absence) of sensitive species and/or habitats within the project area, as well as the information developed from field surveys/reconnaissance, the following materials were reviewed:
 - Pacific Fishery Management Council Fishery Management Plans;
 - California Natural Diversity Data Base (CNDDB) search for Monterey Quad, Monterey County; and
 - Environmental Assessment of the ATOC/Pioneer Seamount Submarine Cable (Kogan et al. 2003).
2. Consultation with local biologists. In order to verify biological information derived from the above sources, contact was made with scientists possessing specific knowledge of marine species/habitats within the project area.

Marine habitats, species of concern, and areas of concern are described in the following sections.

8.2 Marine Habitats

The primary areas of analysis for marine resources are those portions of the intertidal, subtidal, and pelagic zones that constitute the project area and are considered EFH for groundfish, coastal pelagic species, and salmon. Emphasis is given to these areas along the cable burial route.

Intertidal Zone

The intertidal zone is the area affected by tidal flows and wave action. Near the shore landing alternatives, the areas consist primarily of sandy, rockless substrate. Sand is a difficult substrate to occupy and few species do so successfully. Inver-

tebrates that inhabit the sandy intertidal area regions have evolved such adaptive features as thick shells, sand-filtering papillae and burrowing mechanisms rather than the strong attachment devices of rocky intertidal species. Sandy beaches also provide foraging habitat for shorebirds, especially gulls, sandpipers, and plovers.

Common invertebrates of the upper intertidal area are various species of amphipods (genus *Orchestoidea*); the predatory isopod, *Excirolana chiltoni*; and various species of polychaetes, such as *Euzonus mucronata* and *Hemipodus borealis*. The middle intertidal area is characterized by species such as the sand crab, *Emerita analoga*, and the polychaete, *Nephtys californiensis*. The sand crab is generally the most abundant of the middle intertidal organisms, often comprising over 99 percent of the individuals on a given beach (Straughan 1983). The low intertidal area is typically dominated by polychaetes and nemerteans (Straughan 1983).

Subtidal Zone (Soft Bottom Habitats)

In general, Monterey Bay supports a highly diverse and abundant array of benthic infauna (biota that live in the sediments) and epifauna (biota that reside on the substrate). Typically, the soft bottom epifaunal and infaunal assemblages in the nearshore and offshore regions are highly variable and can depend on depth, sediment type, nutrients, dissolved oxygen levels, temperature, and turbidity (Battelle 1990). Yet broad trends in species distribution and composition persist. The highest soft bottom species densities occur in the nearshore shelf habitat and decline between the shelf and upper slopes, remaining relatively constant on the mid-slope, and slightly increasing on the deep slope and basin in this region (Battelle 1990).

Nearshore shelf [<30 meters (100 feet)] soft bottom infaunal assemblages are predominantly composed of polychaetes, amphipods and molluscs. The polychaete (marine worm) fauna in this habitat is largely composed of deposit feeders and carnivores, yet relatively few filter feeders. The lack of abundance of filter feeders may be an indication that the near bottom water is turbid with resuspended sediments to a level that would interfere with the ability of filter feeding polychaetes to persist in higher numbers. Soft bottom epifaunal assemblages in the nearshore shelf consist predominantly of crustaceans, polychaetes, and echinoderms. The distribution and abundance of these species varies seasonally and these changes tend to shift with the oceanographic seasons.

The soft bottom infaunal assemblage associated with the offshore shelf [49-147 meters (160-483 feet)] habitat is composed of ophiuroids, polychaetes, sipunculids, crustaceans, gastropods, and bivalves (Battelle 1990). The upper slope [209-221 meters (685-727 feet)] is dominated by crustaceans, polychaetes, echinoderms, bivalves, and gastropods (Battelle 1990). Infaunal species composition on the slope between 201 meters (660 feet) and 314 meters (1,030 feet), described as the “northern upper slope,” is dominated by crustaceans, bivalves, and polychaetes. In some regions, the lower end of this depth range [274-396 meters

(900-1300 feet)], described as the “mid-slope,” assemblage is dominated by gastropods, ostracods, and polychaetes. The deep slope [305-951 meters (1,000-3,120 feet)] has relatively low species density and varies in composition but is dominated primarily by polychaetes, bivalves, and amphipods.

Hard Bottom Habitats

Hydrographic surveys conducted for the project identified rock outcrops in the vicinity of the cable route. These were found in deeper waters. The features were found to be of low relief and silt covered. Associated fauna typically includes anemone, *Metridium farcimen*; cup coral, *Paracyathus stearnsi*; sea cucumber, *Parastichopus* spp.; sea star, *Stylasterias forreri*; and species of rockfish.

Pelagic Zone

The open water, or pelagic zone, consists of the entire water column from the air-sea interface to the sea bottom. As the depth of water increases in this zone, light, temperature, and dissolved oxygen decrease, while pressure increases. Oceanic waters up to depths of approximately 200 meters (656 feet) are referred to as the epipelagic zone. These waters are well lit, well mixed, and support photosynthetic algal communities. Water from 200 to 1,000 meters (656-3,280 feet) deep is referred to as the mesopelagic zone. The area below 1,000 meters (3,280 feet) is referred to as the bathypelagic zone, which is characterized by complete darkness, low temperature, low oxygen concentrations, and high pressure.

Fish species distribution is heavily governed by the environmental factors characteristic to the zones listed above; they can be described according to zonation. Demersal fish are those that live on or near the seafloor. Representative species common to Central California are summarized in Table 8-1.

Pelagic fish, those associated with the ocean surface or water column, can also be described according to depth zonation. The distribution of pelagic fish is extensive and incorporates much of coastal California. Pelagic species common to the area are grouped according to depth zone and summarized in Table 8-2.

Table 8-1 Depth Distribution of Demersal Fish Common to Central California

Water Depth			
50 - 200 m (66-656 ft)	200 - 500 m (656-1640 ft)	500 - 1,200 m (1640-3936 ft)	1,200 - 3,200 m (3936-10496 ft)
Sanddabs <i>Citharichthys sordidus</i>	Sablefish <i>Anoplopoma fimbria</i>	Thornyheads <i>Sebastolobus</i> spp.	Rattails <i>Coryphaenoides</i> spp.
English sole <i>Parophrys vetulus</i>	Pacific hake <i>Merluccius productus</i>	Pacific hake <i>Merluccius productus</i>	Thornyheads <i>Sebastolobus</i> spp.
Rex sole <i>Glyptocephalus zachirus</i>	Slickhead <i>Alepocephalus tenebrosus</i>	Slickhead <i>Alepocephalus tenebrosus</i>	Finescale codling <i>Antimora microlepis</i>
Rockfish <i>Sebastes</i> spp.	Eelpouts <i>Lycodes</i> spp.	Rattails <i>Coryphaenoides</i> spp.	Eelpouts <i>Lycodes</i> spp.

8. Analysis of Effects

Table 8-1 Depth Distribution of Demersal Fish Common to Central California

Water Depth			
50 - 200 m (66-656 ft)	200 - 500 m (656-1640 ft)	500 - 1,200 m (1640-3936 ft)	1,200 - 3,200 m (3936-10496 ft)
Pink surfperch <i>Zalembius rosaceus</i>	Rockfish <i>Sebastes</i> spp.		
Plainfin midshipman <i>Porichthys notatus</i>	Thornyheads <i>Sebastolobus</i> spp.		
White croakers <i>Genyonemus lineatus</i>			

Source: Morro Group 1999.

Table 8-2 Depth Distribution of Pelagic Fish Common to Central California

Epipelagic Fish <200 m (61 ft)	Mesopelagic Fish 200-1,000 m (61-305 ft)	Bathypelagic Fish >1,000 m (305 ft)
Mackerel (<i>Scomber japonicus</i>)	Black smelt (<i>Bathylagus milleri</i>)	Dragonfish (<i>Idiacanthidae</i> spp.)
Salmon (<i>Onchorhynchus</i> spp.)	Viperfish (<i>Chauliodontidae</i> spp.)	Hatchetfish (<i>Sternoptychidae</i> spp.)
Pacific herring (<i>Clupea pallasii</i>)	Lanternfish (<i>Myctophidae</i> spp.)	Bristlemouth (<i>Gonostomatidae</i> spp.)
Northern anchovy (<i>Engraulis mordax</i>)		
Rockfish (<i>Sebastes</i> spp.)		
Medusafish (<i>Icichthys lockingtoni</i>)		
Pacific sardine (<i>Sardinops sagax</i>)		
Pacific saury (<i>Cololabis saira</i>)		
Pacific argentes (<i>Argentina sialis</i>)		
Tuna (<i>Thunnus</i> spp.)		
Blue shark (<i>Prionace glauca</i>)		
Sevengill shark (<i>Notorhynchus cepedianus</i>)		
Sixgill shark (<i>Hexanchus griseus</i>)		

Source: Bence et al. 1992; ARPA 1995; Ferguson and Cailliet 1990; Cross and Allen 1993

9

Biological Resources Impacts

9.1 Introduction

The following describes the potential impacts the proposed project may have on EFH biological resources within the project area. Impacts were evaluated by identifying potential effects on biota and determining the significance of these effects.

9.2 Significance Criteria

Project impacts on biological resources are considered significant if:

- A population of a threatened, endangered, regulated or other sensitive species is adversely affected, for example, by reduction in numbers; alteration in behavior, reproduction, or survival; or loss or disturbance of habitat. Any “take” of a listed species is considered significant.
- There is a substantial adverse effect on a species, natural community or habitat that is specifically recognized as biologically significant in local, state or federal policies, statutes or regulations.
- Any alteration or destruction of habitat that prevents reestablishment of biological communities that inhabited the area prior to the project.
- Extensive alteration or loss of biological communities in high-quality habitat that lasts longer than one year.

Installation involves cable laying and burial. Offshore operation includes the presence of the cable on the seafloor and repair of the cable should it become damaged. Based on these activities, this analysis evaluates the potential for the project to have the following effects on offshore biological resources:

- Disturbance to benthic biota during cable installation.
- Effects of oil on biological resources in the event of a release during installation.
- Adverse effects to benthic organisms during repair.

- Effects of oil on biological resources in the event of a release during repair.

Installation Impacts

The pre-lay grapnel run, cable laying and burial, and diver activity during cable pull will temporarily disturb the sediments and resident benthic communities along the cable routes. During the pre-lay grapnel run for each cable route, the grapnel blade will penetrate the seabed up to 40 centimeters (the maximum length of the blade). Cable burial, by seaplow and/or ROV, will also disturb the sediments. Although the seaplow is approximately 19 feet wide, the 12-inch-wide hollow share is the portion of the plow that will penetrate the seabed. For a relative comparison of the spatial extent of overall impacts to softbottom substrate from seaplow burial, the area to be traversed (~52 km) was compared to the overall size of the Monterey Bay National Marine Sanctuary (13,784 km²), through which the cable route will cross. The cable route will temporarily affect less than 0.301 km² of bottom. This constitutes an impact of less than 2.2E-05 percent of the bottom substrate found in the Sanctuary, and indicates the relative insignificance of the temporary impact to EFH resources.

Data from hydrographic and marine biological surveys indicate most of the cable route is in soft to medium substrate. Hard substrate identified by the survey data has been identified as primarily occurring between KP 31.7 and 40.6. In these areas burial cannot be achieved and thus, although cable installation impacts to benthos may be reduced, movement of the cable over the life of the project may be more substantial to these communities. Historically, assessment for other cable projects have shown increased colonization by epifaunal organisms on exposed acoustic cables (Kogan et al. 2003).

Biological surveys determined that the substrate is unconsolidated coarse sand and clays. The benthic biota was generally characterized as having low diversity and low abundance, and contained no sensitive species. Based on these data, activities associated with cable installation will disturb soft substrate and its resident biota.

Potential impacts to soft substrate organisms are related to sediment suspension during cable installation, which cause localized, increased turbidity levels, as well as physical burial and destruction of organisms.

Studies conducted to investigate the effects of burial of benthic infauna by offshore oil and gas exploration activities have found that recovery begins almost immediately following burial completion, and that recovery to near pre-disturbance conditions can occur within one year, depending upon the extent of burial and other environmental conditions (Dames and Moore 1981). Following the pre-lay grapnel run, cable burial, and diver jetting (as necessary), the post-installation condition of the seabed will not prevent benthic communities from re-establishing.

The benthic habitat will not be destroyed or altered to the extent that benthic communities cannot re-establish. The benthic communities affected have no special status under federal, state, or local policies, statutes, or regulations. Because resident benthic communities would not be prevented from re-establishing, and sediment disturbance does not affect special status species or habitat, the impact on benthic biota would be adverse but not significant.

The cable vessel engines use diesel for fuel, which is stored on board the vessel. The sea plow holds about 100 liters of hydraulic fluid to operate steering and adjusting burial depth. Other than fuel and hydraulic fluid, the vessels do not transport oil, nor do they perform operations that are common causes of oil releases, such as fuel transfers. However, if there were a collision severe enough to breach the fuel tank, oil could be released to marine waters.

Although a marine oil release from a cable lay vessel during installation is considered to be extremely unlikely, the potential effects on marine resources are evaluated below. The affected area would be highly dependent on the location, time and environmental conditions at the time of the release. For the purposes of this analysis, the effects of oil are described. These effects could apply to the resources identified in the project area.

The effects of oil pollution on biological resources range from temporary, sub-lethal pathological effects (e.g., corneal lesions and changes in blood parameters) to mortality.

Mitigations proposed by the applicant to prevent an oil release, and contain and remove a spill if one occurs include a shipboard oil spill prevention and response plan, navigational measures to prevent collision, and on-water spill control equipment on the support boats to respond to a release. A marine oil release could have significant effects on marine resources. However, the risk of the project activities resulting in an oil release is no greater than the background risk for marine oil spills. In addition, the mitigation measures proposed by the applicant to prevent, contain, and recover a spill, if one occurs, further reduce the potential for marine resources to be adversely affected by project activity, making the effect adverse but not significant.

Operation Impacts

If a repair is necessary, the disturbance to benthic organisms would be similar to those occurring during cable installation, except that the disturbance would be localized rather than along the entire route. Potential impacts to soft substrate benthic organisms are related to sediment suspension, causing reduced light penetration, as well as physical burial and destruction of organisms. If the repair location is near one of the rock outcrops, the retrieval point for the repair will be relocated - either along the affected cable or by approaching from the opposite side - to avoid contact with the rock outcrop. Therefore, there would be no potential for

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disturbance to hard-substrate biota. In addition, because resident benthic communities would not be prevented from re-establishing, the effect of cable repair on biological resources is less than significant.

Although considered extremely unlikely, there is a potential for the vessels involved in cable repair operations to have accidents that could result in a release of oil to marine waters. The potential effects of oil on marine biological resources range from temporary, sublethal pathological effects to mortality. The area affected would depend on the location, time, and environmental conditions at the time of the release.

Mitigations proposed by the applicant to prevent an oil release, and contain and remove a spill if one occurs, include a shipboard oil spill prevention and response plan, navigational measures to prevent collision, and on-water spill control equipment to respond to a release. A marine oil release could have significant effects on marine resources. However, the risk of the project activities resulting in an oil release is no greater than the background risk for marine oil spills. In addition, the mitigation measures proposed by the applicant to prevent, contain, and recover a spill, if one occurs, further reduce the potential for marine resources to be adversely affected by project activity, making the effect adverse but not significant.

Cable Landing Site

Project activities at the cable-landing sites for Alternative 1 and Alternative 2 involve the use of HDD methods to bring the conduit onshore. Alternative 2 proposes to use an existing Duke pipeline to bring the cable onshore, along with HDD to install the cable beneath the harbor channel to reach MBARI property on the south side. Based on the discussion in Section 3.5 and the proposed mitigation measures presented in Table 11-1, the effects on biological resources is not expected to occur.

Operation Impacts

Once installed, the cable landing will be subsurface may require periodic maintenance. Any future maintenance activities onshore or within the bay would require additional permit submittals, and agency consultation to ensure impacts to biological resources are minimized.

Project Removal

The project has a duration of 25 years. The alternatives for removing the cable system range from leaving the cable in place to partial or complete removal of the entire cable.

Pursuant to the standard lease terms of the CSLC, upon the expiration or sooner termination of a lease, the CSLC may take title to any or all improvements, or the CSLC can require that all or any portion of the cables be removed at the CSLC's

9. Biological Resources Impacts

discretion. In removing any or all improvements, all permits or other governmental approvals must be obtained prior to any removal.

At the end of the lifetime of the project, the operator would have the cable inspected to determine its condition. Cable inspection offshore would consist of an ROV inspection. If it is authorized by agencies with jurisdiction over the cable, removal would be complete if the inspection confirms that the cable is still buried.

In addition to an inspection, if the cable is partially or completely removed, the equipment and procedures used would be similar to those used during project installation. A vessel would be used to remove the cable from the seafloor and store and transport the cable for disposal. A grapnel and/or ROV would be used to locate, cut, and remove the cable from the seafloor.

As discussed previously in this section, the cable installation and operation would not result in significant impacts to biological resources. The potential impacts to biological resources would be reduced to less than significant levels by the implementation of proposed mitigation measures. The same types of operations and accompanying mitigation measures would apply to the marine activities carried out during cable removal. Since the activities required for removal would be equivalent to those for installation and operation, it is anticipated that no significant impacts would result from the range of removal activities identified.

At the time that a specific plan for removal is proposed, agencies with jurisdiction would review the potential environmental consequences that could result from the proposed activities and make a conclusion about what level of additional environmental review, if any, would be necessary. The impacts would be assessed based on the current equipment and techniques for removal, project-specific information, historical data collected during the lifetime of the cable, and the current environmental conditions in the cable area.

9.2.1 Species of Concern

This section describes special-status species that may have suitable habitat within the project area, as well as those that may be directly or indirectly affected by project activities.

Steelhead (*Oncorhynchus mykiss*)

The steelhead is an anadromous species found in coastal streams and creeks in California and Oregon. It generally spends from one month to several years in the freshwater streams, migrates to the sea where it spends one to four years, then returns to streams to spawn. Most spawning occurs from December to May but may occur in the fall as well (Jones and Stokes Associates, Inc. 1981).

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The Southern California steelhead ESU was federally listed as endangered under the ESA in October of 1997.

Coho Salmon (*Oncorhynchus kisutch*)

Central California ESU coho salmon are federally listed as threatened under the federal ESA and listed as endangered under the state ESA. They were listed as threatened by federal ESA on December 2, 1996 and listed as endangered by California ESA on December 31, 1995. Coho salmon generally begin their migration in late summer or fall, and spawning is completed by mid-winter.

California Grunion (*Leuresthes tenuis*)

Grunion (*Leuresthes tenuis*) are members of the silversides family, Atherinidae, along with the jacksmelt and topsmelt. They normally occur from Point Conception, California, to Point Abreojos, Baja California. Occasionally, they are found farther north to Monterey Bay and south to San Juanico Bay, Baja California. They inhabit the nearshore waters from the surf to a depth of 60 feet. Tagging studies indicate that they are non-migratory.

It spawns at night high on sandy beaches, usually from February to August. Spawning occurs for only a few hours per season, on the third or fourth night following either a full or new moon, and then only 1 to 3 hours after a very high tide. The eggs remain buried in the sand for about 10 days until the next high tide washes them out to sea, where the young develop. Although it is not listed as threatened or endangered, this species is a popular sport fish, the taking of which is regulated (Jones and Stokes Associates, Inc. 1981).

Pismo Clam (*Tivela stultorum*)

The Pismo clam was once abundant on the sandy beaches of Central and Southern California. Pismo clams burrow no more than 6 inches deep and are usually found in 1 to 3 feet of water at low tide. Some sources have stated that Pismo clams have a depth range of approximately 90 feet. The Pismo Clam is harvested by recreational clammers and preyed upon by sea otters. Although it is not listed as threatened or endangered, CDFG regulates harvest levels within reserves and has established clam reserves on beaches in Central California.

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Analysis of Effects Conclusion

The preceding *Analysis of Effects* presents an assessment of the potential short and long-term effects to EFH that will occur based on construction, operational, and abandonment activities associated with the installation of the MARS cable. Based on the definition for adverse effect, as provided in the NMFS Guidance, it is predicted that no reduction in quality and/or quantity of EFH is likely. Minimal short-term impacts to benthic biota will occur based on cable laying methods and HDD activities, but these communities will reestablish to near pre-construction levels within the first year following construction. Direct impacts to fish communities managed under the three Pacific FMPs will not occur. Fish will most likely compensate for short-term impacts to feeding grounds during construction, and resume normal activities in time. No toxicological impacts which could result in acute or chronic effects will occur based on the methods and materials to be used during construction. No sensitive nursery areas are to be crossed by the cable route and thus no reduction in population yields are expected.

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